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Abstract

CONSTRUCTION OF RESEARCH REACTOR MP FOR TESTING FUEL ELEMENT AND MATERIALS

Goncharov V.V., Babulevich E.N., Nikolaev Yu.G. et al

The report describes a new research reactor MP of an original design. This reactor was built in the Atomic Energy Institute named after I.V. Kurchatov for testing fuel elements and materials. It combines the advantages of a pool-type reactor and those of a channel-type reactor.

The reactor power is equal to 20 MW. The maximum thermal neutron fluxes on uranium and in the neutron trap equal $2 \cdot 10^{14}$ n/cm^{2}sec and $6 \cdot 10^{14}$ n/cm^2 sec respectively.

Highly enriched uranium is used as a fuel.

The reactor fuel assemblies consist of several thin-walled, three-layer, tubular fuel elements each provided with three longitudinal spacing ribs; the central or fuel layer of a fuel element has a uniform thickness.

The fuel assemblies are loaded into the channels and are water-cooled under pressure.

The channels form a square lattice of a spacing widening in the bottom-to-top direction, i.e. all the reactor channels, except the central one, are inclined.

Within the reactor core of 1 m heigh, blocks made of metallic berillium are installed between the channels; the side reflector is assembled of graphite blocks enclosed in an aluminium can. The heat-transferagent (ordinary water) is conveyed to and drained from each channel from the top.

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The core, channels, water coolant tubes and their collectors are submerged in the water pool.

Besides the first circuit with water under pressure for cooling fuel elements, there is another circuit in which the pool water circulates to cool the berillium and graphite blocks of the core and reflector stacking.

Uniflow U - shaped loop channels are installed in nine points of the core and in four points of the reflector. The maximum diameter of the loop channel equals 150 mm in the core, and 220 mm in the reflector.

The reactor is also furnished with a number of experimental channels for irradiation of materials. Besides that, the material samples can be irradiated in the central part of the fuel assembly of any channel of the reactor.

The report gives the description of all main design units and technological systems of the reactor and its loop units.

The part of the report devoted to the description of the loop units sets forth the principal characteristics of the experimental loops of the MP reactor: water loop with a volumetric water boiling in the core; non-boiling water loop; water loop with volumetric water boiling in the core and with the equipment made of carbon steel; loop with organic coolants, gas loop with carbon dioxide coolant, gas loop with helium coolant.

The report provides the reactor physical and technical characteristcs obtained during its physical start-up and in the course of reaching its rated capacity.